

What is claimed is:

1. A steam humidifier having a gas burner comprising:
  - a main frame;
  - a canister for containing water, said canister having an upper part and a sealingly releasable lower part;
  - a heat exchanger heated via said gas burner and disposed within said canister to deliver heat to water adapted to be retained in said canister;
  - said upper part of said canister mounted to said main frame;
  - a movable lower frame coupled to said lower part of said canister, said lower frame movably mounted to said main frame such that after said lower part of said canister is released from said upper part of said canister, said lower frame permits said lower part of said canister to be lowered below said heat exchanger.
2. A steam humidifier as claimed in claim 1 wherein said canister is vertically disposed and said sealingly releasable lower canister part is substantially vertically beneath said upper canister part.
3. A steam humidifier as claimed in claim 1 including a forced air flue about said gas burner, a downstream end of said flue coupled to said heat exchanger and said heat exchanger mounted to said upper canister part.
4. A steam humidifier as claimed in claim 3 wherein said heat exchanger configured as a coil having an upstream coil end and a downstream coil end, said downstream coil end mounted to said upper canister part.

5. A steam humidifier as claimed in claim 1 including an enclosure about said frame, said frame being upright and substantially surrounding said canister, said canister being vertically disposed, said frame having an upper and a lower region, control electronics disposed within said frame upper region, said enclosure having upper and lower vents, said upper vents located near said control electronics and said lower vents located therebeaneath on said enclosure such that convection cooling moderates a temperature of said control electronics.

6. A steam humidifier as claimed in claim 4 wherein said flue forces air substantially downward, said downstream end of said flue coupled to said upstream coil end of said heat exchanger both of which are disposed in said lower part of said canister, said coil having a plurality of coil loops, said coil loops running vertically upward to said downstream coil end mounted to said upper canister part.

7. A steam humidifier as claimed in claim 6 wherein said frame has one or more open work regions such that when said lower canister part is moved into said lower region of said frame, said heat exchanger coil is exposed via said one or more open work regions of said frame thereby permitting maintenance on said heat exchanger.

8. A steam humidifier as claimed in claim 7 including a slide control to release and lower said lower canister part from said upper canister part; said slide control interposed between said main frame and said movable lower frame.

9. A stream humidifier having a gas burner with a forced air flue comprising:  
a canister for containing water, said canister having an upper part and a lower part;  
a heat exchanger coupled downstream of said gas burner and forced air flue, said heat exchanger configured as a coiled chamber with an upstream end coupled to said flue and a

downstream end mounted through said upper part of said canister, said heat exchanger disposed within said canister to deliver heat to water adapted to be retained in said canister;

each loop of said coiled chamber spaced apart to permit relatively rapid thermal expansion and contraction in the form of a thermal shock adapted to release scale adhered thereon.

10. A steam humidifier as claimed in claim 9 wherein said humidifier includes a main frame having mounted thereto said upper part of said canister.

11. A steam humidifier as claimed in claim 10 wherein said upper part of said canister is releasably sealed to said lower part of said canister, and the humidifier includes a movable lower frame coupled to said lower part of said canister, said lower frame movably mounted to said main frame such that after said lower part of said canister is released from said upper part of said canister, said lower frame permits said lower part of said canister to be lowered below said heat exchanger.

12. A steam humidifier as claimed in claim 11 including an enclosure about said frame, said frame being upright and substantially surrounding said canister, said canister being vertically disposed, said frame having an upper and a lower region, control electronics disposed within said frame upper region, said enclosure having upper and lower vents, said upper vents located near said control electronics and said lower vents located therebeneath on said enclosure such that convection cooling moderates a temperature of said control electronics.

13. A steam humidifier as claimed in claim 12 wherein said flue forces air substantially downward, said downstream end of said flue coupled to said upstream coil end of said heat exchanger both of which are disposed in said lower part of said canister, said coil having a plurality of coil loops, said coil loops running vertically upward to said downstream coil end mounted to said upper canister part.

14. A steam humidifier as claimed in claim 13 wherein said frame has one or more open work regions such that when said lower canister part is moved into said lower region of said frame, said heat exchanger coil is exposed via said one or more open work regions of said frame thereby permitting maintenance on said heat exchanger.

15. A steam humidifier as claimed in claim 14 including a slide control to release and lower said lower canister part from said upper canister part; said slide control interposed between said main frame and said movable lower frame.

16. A steam humidifier with a burner supplied with a premix of natural gas and forced air, said natural gas under a low pressure comprising:

a radiant burner configured for modulated operation from a blue flame mode through a radiant mode;

a combustion chamber partially deployed in an evaporation tank, said radiant burner disposed within said combustion chamber;

said evaporation tank adapted to contain water;

a heat exchanger coupled downstream of said combustion chamber and disposed within said evaporation tank, said heat exchanger adapted to be substantially disposed in said water.

17. A steam humidifier as claimed in claim 16 wherein said natural gas under low pressure is supplied at less than 1 p.s.i. and said burner, combustion chamber and evaporator tank are vertically disposed and said heat exchanger is configured as an upwardly disposed coiled chamber with an upstream end coupled to said combustion chamber.

18. A steam humidifier as claimed in claim 17 wherein said coiled chamber heat exchanger includes a plurality of coil loops, said coil loops each spaced apart with respect to each other.

19. A steam humidifier as claimed in claim 16 wherein said radiant burner has a predetermined free air flame height and said radiant burner has an outer burner surface and said combustion chamber has an inner chamber wall, said burner surface being spaced about 5 to 6 times said free air flame height away from said combustion chamber wall.

20. A steam humidifier as claimed in claim 16 wherein said radiant burner has a cross-sectional area and said combustion chamber is cylindrically shaped and having interior chamber walls, said burner begin axially disposed within said combustion chamber, an annulus formed between said burner and said interior chamber walls of said combustion chamber, said annulus having a cross-sectional area, said burner cross-sectional area creating a 2 to 1 choke with respect to said annulus' cross-sectional area.

21. A steam humidifier as claimed in claim 16 wherein said radiant burner has a cross-sectional area and said combustion chamber is cylindrically shaped and having interior chamber walls, said burner begin axially disposed within said combustion chamber, an annulus formed between said burner and said interior chamber walls of said combustion chamber creating a choke with respect to forced air and said burner's cross-sectional area.

22. A steam humidifier as claimed in claim 21 wherein said modulation is enhanced by a gas flow restriction due to said choke and a head loss due to a gas flow speed of about 3,000 to 9,000 feet per minute in said combustion chamber.

23. A steam humidifier as claimed in claim 16 wherein said modulation is about 10 to 1 based upon the ratio of Btu per hour compared to a natural gas input.

24. A steam humidifier as claimed in claim 18 wherein said radiant burner has a predetermined free air flame height and said radiant burner has an outer burner surface and said combustion chamber has an inner chamber wall, said burner surface being spaced about 5 to 6 times said free air flame height away from said combustion chamber wall.

25. A steam humidifier as claimed in claim 24 wherein said radiant burner has a cross-sectional area and said combustion chamber is cylindrically shaped and having interior chamber walls, said burner begin axially disposed within said combustion chamber, an annulus formed between said burner and said interior chamber walls of said combustion chamber, said annulus having a cross-sectional area, said burner cross-sectional area creating a 2 to 1 choke with respect to said annulus' cross-sectional area.

26. A steam humidifier as claimed in claim 25 wherein said modulation is enhanced by a gas flow restriction due to said choke and a head loss due to a gas flow speed of about 3,000 to 9,000 feet per minute in said combustion chamber.

27. A steam humidifier as claimed in claim 26 wherein said modulation is about 10 to 1 based upon the ratio of Btu per hour compared to a natural gas input.

28. Method for applying a thermal shock to a steam humidifier having a gas burner with a forced air flue, said steam humidifier having a canister of water to be evaporated as steam, a heat exchanger disposed within said canister and configured as a coiled chamber with spaced apart loops, said heat exchanger coupled downstream of said gas burner and forced air flue and having a downstream end mounted through said upper part of said canister, the method comprising:

causing relatively rapid thermal expansion and contraction of said coiled chamber heat exchanger in the form of a thermal shock adapted to release scale adhered thereon;

said thermal shock resulting from either activation and then sudden deactivation of said gas burner substantially without water in said canister or activation of said gas burner substantially without water in said canister and sudden flooding of said canister with water substantially simultaneously with deactivation of said gas burner;

said thermal shock causing substantially sudden expansion and then contraction of said coiled chamber heat exchanger.

29. A method as claimed in claim 28 including the step of separating said upper canister part from said lower canister part to permit cleaning thereof.